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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-------------------------|-------------|----------------------------|---------------------|------------------|
| 10/785,424 | 02/23/2004 | Subbareddy Kanagasabapathy | 51123 | 8584 |
| 21874 | 7590 | 06/19/2006 | EXAMINER | |
| EDWARDS & ANGELL, LLP | | | LEE, SIN J | |
| P.O. BOX 55874 | | | ART UNIT | |
| BOSTON, MA 02205 | | | PAPER NUMBER | |
| | | | 1752 | |
| DATE MAILED: 06/19/2006 | | | | |

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/785,424

Applicant(s)

KANAGASABAPATHY ET AL.

Examiner

Sin J. Lee

Art Unit

1752

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 April 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 11,12 and 14-19 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 11,12 and 14-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 12 July 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____. |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____. | 6) <input type="checkbox"/> Other: _____. |

DETAILED ACTION

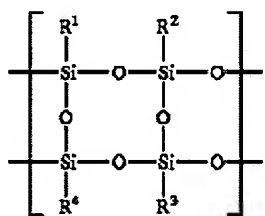
Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

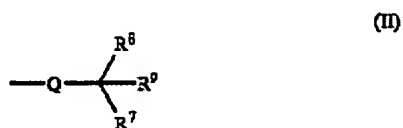
(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 11, 12, 14-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sooriyakumaran et al (US 2002/0081520 A1).

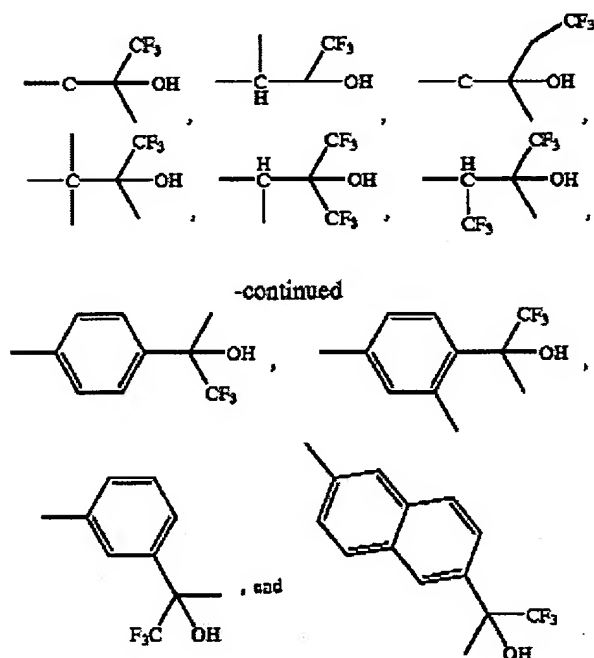
Sooriyakumaran teaches ([0024]) a positive lithographic photoresist composition comprising a fluorocarbinol and/or fluoroacid functionalized *silsesquioxane* polymer or *copolymer* and a photoacid generator. Sooriyakumaran's fluorocarbinol and/or fluoroacid functionalized silsesquioxane polymer comprise a monomer unit of the following structure (I) (see [0044]-[0045])



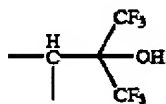
in which R¹-R⁴ are independently selected from the group consisting of substituents having the following structure (II)



Sooriyakumaran furthermore teaches (see [0047]) following compounds as examples for the substituents having the structure (II) shown above



Since there are only ten compounds shown above, it would have been obvious to one skilled in the art to have

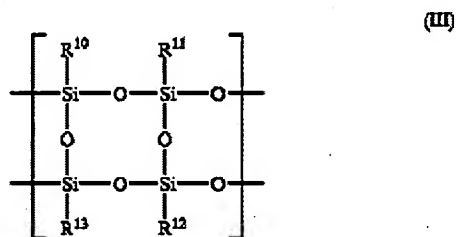


(which includes a 1,1,1,3,3,3-hexafluoro-2-propanol moiety) as Sooriyakumaran's substituent having the structure (II) with a reasonable expectation of obtaining a fluorocarbonol and/or fluoroacid functionalized silsesquioxane polymer suitable for use in

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lithographic photoresist compositions. Therefore, Sooriyakumaran teaches present silsesquioxane resin comprising hexafluoropropylalcohol group.

Sooriyakumaran furthermore teaches ([0048] and [0049]) that the structure (I) monomer units (as shown above) may be used to form a fluorocarbonol functionalized copolymer comprising the structure (I) monomer units shown above and monomer units having the following structure (III)



in which R^{10} - R^{13} are independently H, linear or branched alkyl, or an acid-cleavable moiety, with the proviso that at least one of R^{10} - R^{13} is an *acid-cleavable moiety*.

Therefore, Sooriyakumaran teaches present silsesquioxane resin comprising hexafluoropropylalcohol groups and photoacid-labile groups.

With respect to present limitation "a silsesquioxane resin that comprises three or more distinct repeat units", Sooriyakumaran teaches ([0053]) that his copolymer may comprise different monomer units each having structure (III). Besides, Sooriyakumaran furthermore teaches that his copolymer may also comprise *one or more other monomer units* such as (meth)acrylic acid monomer units to enhance development (see [0053]-[0054]). Therefore, it would have been obvious to one skilled in the art to include in Sooriyakumaran's copolymer *one or more other monomer units* such as acrylic acid monomer unit and methacrylic acid monomer unit with a reasonable expectation of

enhancing development. Therefore, Sooriyakumaran's teaching renders obvious present silsesquioxane resin that comprises three or more distinct repeat units, the repeat units comprising hexafluoropropylalcohol groups and photoacid-labile groups.

In [0075], Sooriyakumaran teaches a process for generating a resist image on a substrate comprising the steps of: (a) coating a substrate with a film comprising his resist composition; (b) imagewise exposing the film to radiation; and (c) developing the image. Sooriyakumaran furthermore teaches ([0077]) that most preferably, UV radiation having a wavelength of 157 nm or 193 nm is used for the imagewise exposure step. .

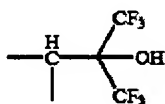
With respect to present limitation " . . . wherein the exposing of the photoresist does not result in a detectable output of Si species at a concentration of 1×10^{13} molecules/cm² or greater", present specification states on pg.3 "[w]e have now discovered silsesquioxane polymers, including *fluorinated silsesquioxane polymers* can exhibit reduced or no detectable (e.g., no detection at levels of 10^{13} or 10^{12} molecules/cm²) outgassing of Si species upon exposure to laser radiation (laser radiation being argon-fluoride (ArF, 193 nm) laser at a dose of 50 mJ/cm²). . . . We also have surprising found that such outgassing of Si species does occur with siloxane (i.e., linear *rather than a ladder silsesquioxane polymer*) and other non-silsesquioxane polymers." Therefore, it is the Examiner's position that exposing Sooriyakumaran's photoresist, which contains his copolymer as discussed above, to 193 nm radiation would *inherently* not result in a detectable output of Si species at a concentration of 1×10^{13} molecules/cm² or greater as presently recited in claim 11 because Sooriyakumaran's copolymer is a ladder silsesquioxane polymer which contains

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pendant hexafluoropropylalcohol groups (i.e., Sooriyakumaran's polymer is a fluorinated silsesquioxane polymer). Thus, Sooriyakumaran's teachings render obvious present inventions of claims 11 and 18.

With respect to present claim 12, Sooriyakumaran teaches ([0075]) that the substrate may be coated with an organic anti-reflective layer prior to deposition of the resist composition. Therefore, the prior art's teaching renders obvious present invention of claim 12.

With respect to present claim 14, as discussed above, Sooriyakumaran teaches a copolymer comprising the structure (I) monomer units shown above, in which R¹-R⁴ are represented by the



moiety, and the structure monomer units (III) shown above, in which at least one of R¹⁰-R¹³ is an *acid-cleavable moiety* (the rest of the non-acid cleavable moiety of R¹⁰-R¹³ being H, linear or branched alkyl). As suitable acid-cleavable functionalities, Sooriyakumaran teaches (see [0050]) esters of the formula -(L¹)_n-(CO)-OR¹⁴, carbonates of the formula -(L¹)_n-O-(CO)-O-R¹⁵, and ethers of the formula -OR¹⁶, wherein R¹⁴-R¹⁶ are selected so as to render the functionality acid-cleavable (for example, those groups listed in the last eight lines of [0050]), n is zero or 1, and L¹ is a linking group such as an *alkylene chain* or a phenylene ring. Based on this teaching, it would have been obvious to have L¹ to be a linking group of an alkylene chain with a reasonable expectation of obtaining a fluorocarbonol and/or fluoroacid functionalized

silsesquioxane polymer suitable for use in lithographic photoresist compositions.

Therefore, Sooriyakumaran's teaching renders obvious present invention of claim 14 (besides, none of the silsesquioxane polymers made in Sooriyakumaran's working examples contains aromatic groups).

With respect to present claims 15 and 16, Sooriyakumaran teaches ([0076]) that after the resist composition is coated onto the substrate, the resist film is heated to an elevated temperature of 90-160°C for about 1 minute before the imagewise exposure step. Also, in [0078], Sooriyakumaran teaches that after the photoresist composition is exposed to radiation, the photoresist is again heated to an elevated temperature for a short period of time before the development step. Therefore, the prior art's teachings render obvious present inventions of claims 15 and 16.

3. Claims 17 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sooriyakumaran et al (US 2002/0081520 A1) in view of Uenishi et al (US 6,489,080 B2).

Sooriyakumaran is discussed above in Paragraph 2. As one of examples of acid-labile group, Sooriyakumaran teaches tetrahydropyranyl ether group (see [0051]), and it is well known in the art that the tetrahydropyranyl ether group and an acetal group are equivalent acid-labile groups, as evidenced by Uenishi, col.36, lines 27-35. Therefore, it would have been obvious to one skilled in the art to use an acetal group as the acid-labile group in Sooriyakumaran's copolymer because tetrahydropyranyl ether group and an acetal group were art-recognized acid-labile groups at the time the

present invention was made. Therefore, Sooriyakumaran in view of Uenishi would render obvious present inventions of claims 17 and 19.

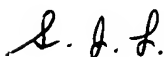
Response to Arguments

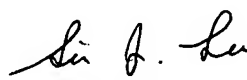
4. Applicants argue that Sooriyakumaran does not teach or suggest present rein comprising three or more distinct repeat units nor the present acetal group. The Examiner believes that those arguments are already addressed in Paragraph 2 above.

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sin J. Lee whose telephone number is 571-272-1333. The examiner can normally be reached on Monday-Friday from 9:00 am EST to 5:30 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cynthia Kelly, can be reached on 571-272-1526. The fax phone number for the organization where this application or proceeding is assigned is **571-273-8300**.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


S. Lee
June 10, 2006


SIN LEE
PRIMARY EXAMINER